

**U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION REPORT#7**

Date: August 19, 2003
From: David Dorian, On-Scene Coordinator, USEPA Region IV
Subject: Starmet CMI, Inc. , Barnwell County, Barnwell, S.C.
To: Shane Hitchcock, Branch Chief, Emergency Response and Removal Branch
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POLREP No.: POLREP seven (7)

I. BACKGROUND

Site #: A48Q
EPA ID #: SCD987570405
Street address: 365 Metal Drive
City, county, state: Barnwell, Barnwell County, S.C.
NPL Status: Not listed.
State Notification: Site was referred to EPA by SCDHEC

II. SITE INFORMATION

A. Incident Category

The Emergency Response and Removal Branch (ERRB) initiated an emergency removal action at Starmet ("Site") on June 24, 2002, to prevent the release of depleted uranium from the wastewater retention ponds behind the facility and to mitigate other risks posed by hazardous materials on site. U_{238} is listed in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as a hazardous substance. Analytical data indicated a concentration of U_{238} in excess of 1.6×10^5 pico Curies/liter (pCi/L) in the wastewater ponds. The two ponds, measuring 240 ft by 50 ft, contained approximately 550,000 gallons of wastewater. The roof covering the ponds was destroyed in a fire in February 2001, allowing the volume of waste water in the ponds to increase due to rain water infiltration. The pond liners were in poor condition and there were indications that the liner system was failing. At the time of the initial response, the ponds were in danger of overflowing due to heavy rains.

Starmet processed depleted uranium hexafluoride (UF_6), a byproduct of the gaseous diffusion process. The UF_6 was shipped in cylinders to Starmet to be processed into uranium

tetrafluoride (UF_4), a stable solid compound (as so known as “green salt”). Hydrogen fluoride is the byproduct of UF_6 to UF_4 conversion. The hydrogen fluoride was neutralized with lime to produce calcium fluoride.

During its operational history, Starmet used some of the UF_4 in the manufacture of uranium metal “derbies” which were shipped to Nuclear Metals, Concord, Massachusetts to be processed into materials used in national defense. Starmet reduced the UF_4 with magnesium, and the resulting magnesium fluoride (MgF_2) is a waste product that remains on site. Nuclear Metals is no longer operating and became a listed Superfund site (Site # 0100550) as of June 14, 2001.

Additionally, Starmet received two shipments of drums of UF_4 in the form of “yellow cake” and “lump cake” from the Department of Energy. Of these shipments, approximately 6000 drums remain on site.

Starmet currently has approximately 12,130 drums of UF_4 stored on site. The facility also has an estimated 4,300 drums of calcium fluoride and 116 drums of magnesium fluoride. These are all low level radioactive waste material stored on site. In addition to the filled drums of UF_4 , approximately 115 tons of cut 55-gallons drums, stored in B-25 boxes, contaminated with UF_4 residue remain on site. Adjacent to the B-25 boxes are 11 SeaLand boxes filled with radioactive debris, and at least three drums of solvent, believed to be mixed wastes. Approximately 1500 drums and un characterized quantities of loose dry active waste (DAW) is also part of the processing legacy. Additionally, Starmet received radioactive metals for its metal reclamation (“metal melt”) process, and tons of this radioactive metal remains on site. Starmet re-plated uranium counterweights for the aircraft industry and the defense department. From this process, Starmet generated spent plating solutions which contained cadmium, nickel, and cyanide.

B. Site Description

1. Site location

The site is located at 365 Metal Drive, Barnwell, South Carolina. The property surrounding the site is planted in pine trees. The nearest residential property is 2 miles from the site. The town of Barnwell is approximately 8 miles from the site on well paved roads. The facility consists of two large steel-framed buildings and the former ponds. Both of the buildings are surrounded by chain linked fences in good repair.

2. Description of threat

The initial threat, the potential for continued release of radioactive wastewater from the retention ponds has been mitigated. The remaining threat is the radioactivity from the approximately 16,500 drums of low-level radioactive waste on site. Currently radioactive dose rate emanating at the fence line is in excess of Nuclear Regulatory Standards. The UF_4 is assumed to be the source of the activity.

Many of the drums inside the building have deteriorated from excessive weight, the

pressure of other stacked drums above them, and chemical corrosion. Some drums have already failed, and leaking UF₄ and uranium contaminated substances are visible. Leaking UF₄ poses a threat as an airborne alpha emitter. The labeling system is haphazard and the contents of many drums remain unknown.

Starmet had the power to the facility shut off on July 26, 2002, allowing UF₄ dust and plating vat fumes to accumulate in the buildings. The facility is abandoned, other than EPA activity. Were it not for EPA's maintenance of the facility's ventilation system, radon gas (a daughter product of uranium) would accumulate beyond regulatory standards.

C. Preliminary Assessment/Site Inspection Results

There are more than 16,500 drums of radioactive material and 115 tons of UF₄ stored in B-25 boxes, in addition to other hazardous waste stored at this facility. Prior to EPA's arrival, there is no one at the facility to maintain the ventilation system or fire suppression system.

III. RESPONSE INFORMATION

A. Current Situation

The ponds are now completely drained, the contaminated soil has been excavated, and the ponds are presently being backfilled with clean clay. The wastewater evaporative units went on line December 2, 2003, and processed over 537,000 gallons of uranium contaminated wastewater from the retention ponds. The condensate (brine) was solidified with a polymer (polyacrylate) forming a green gel suitable for transportation and disposal offsite to the Envirocare facility in Utah. In total, 45 20-cubic yard roll-offs, containing more than 675 tons of stabilized solids, have been filled with the brine-polymer gel and sent offsite for disposal.

After treating all of the wastewater, EPA removed the HDPE liners from both ponds and the sludge which had accumulated above the liner. Uranium was measured as high as 1900 ppm in the sludge. Contaminated soil on the periphery of the pond was scraped and removed with the liner and sludge. Contaminated aboveground plumbing at the south end of the ponds was removed and disposed of.

EPA removed and disposed of the first 0.5 to 1.0-inch layer of sand directly beneath the liner. Additional sand was removed in areas where breaches in the liner had occurred until all visible stains were removed. EPA established two 31-point grids (20' x 40'), one for each pond, to track contamination. More extensive sampling conducted with a Niton XRF unit measured total uranium (combined with independent laboratory confirmation) delineated contaminated areas. Contamination levels were established based on six-point composite sampling; however, the composite sampling was occasionally augmented by biased sampling to ensure removal of any hot spots. Prior to commencing the excavation, EPA took cores samples of the West Pond to characterize vertical contamination throughout the sand, gravel, and clay layers. For the East Pond, EPA dug trenches to sample these layers.

Large sections of the French drain system beneath the pond measured no radioactivity

above background. These sections were left in place and covered by the backfill. Similarly, uncontaminated geo-fabric and gravel remain in place beneath the five feet of clean fill. The section of the French drain that ran beneath a breach in the liner and connected to the contaminated West Pond sump wastewater was removed through the point where no activity was measured. The sump for each pond along with the soil surrounding them were excavated and will be disposed of in a landfill permitted to accept low-level radioactive waste.

EPA initially adopted the 10^{-4} PRG for industrial soils (179 pCi/g) as the ARAR for the pond excavation; however, during the course of the removal it became apparent that EPA could, for minimal costs, meet the more rigorous residential standard of 74 pCi/g. The 10^{-4} residential PRG, was ultimately met for the pond excavation. The maximum level of soil contamination remaining in place was 32 pCi/g, as measured by the XRF. The top two to three feet of soil will be at or below background for the area. For piping and plumbing which had no visible soils attached, EPA removed all materials with measurable activity (both fixed and non-fixed) in excess of twice background.

One of the facility's three evaporative units has been decontaminated. The other two units will remain on site to treat process and decontamination water that will be generated during the drum removal.

EPA contractors reduced radioactive contamination in sections of the DU building to facilitate characterization and removal of the drums. Drums were restaged to clear viable work areas with minimum dose rates and to remain consistent with the ALARA principle. All "smearable" (non-fixed) contamination was removed and most of the fixed contamination was removed through extensive cleaning of the concrete floor.

B. Next Steps

EPA continues to negotiate with the Department of Justice (representing the Department of Energy and the Department of Defense), United States Enrichment Corporation and Cameco, a third PRP. During the negotiation stage, EPA will characterize the DOE generated drums for disposal.

The backfilling of the ponds will be completed and vegetatively stabilized with a vegetative cover upon completion. Radioactive soils and debris generated during the pond excavation will be sent offsite for disposal.

Three drums of solvent uncovered in a SeaLand box will be characterized for disposal. Neutralization of nitric acid liquids from the vats in the chromate and nickel counterweight plating lines (located in the DU Building) and the derby pickling line (located in the Reduction building) is now complete; however, two vats (about 400 gallons) of radioactive cyanide-cadmium plating waste remains on site. The cyanide plating bath will be neutralized and the neutralization solids sent off for disposal.